MAP READING GUIDE

CMA

KATOOMBA

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1 THE AIM OF THIS BOOKLET

To provide information for map users enabling them to obtain the fullest value out of their maps.

To inform the map user of the types of maps available so that they may select the one most suited to their needs.
The booklet is directed to the non-professional map user and explanations are kept as non-technical as possible.

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3 ACKNOWLEDGEMENT

This presentation is based on similar booklets produced by the Department of Lands and Survey, New Zealand, and by the Division of National Mapping, Canberra, ACT.

Some of the text and illustrations have been reproduced from these booklets with the permission of the Surveyor General, New Zealand, and the Director of National Mapping.

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4 TOPOGRAPHIC MAPS

Maps have been used since ancient times as a means of indicating pictorially the relative positions of features of the earth's surface.
Today, maps are able to fulfil any of a multitude of requirements depending on the type of features depicted.
Maps may be used as an aid to detailed planning and development of any area of land from residential sections to entire countries. This is planning for the future, and involves engineers, town planners, surveyors, architects and many other specialists making intelligent and efficient use of natural resources and features to the greatest benefit of all.

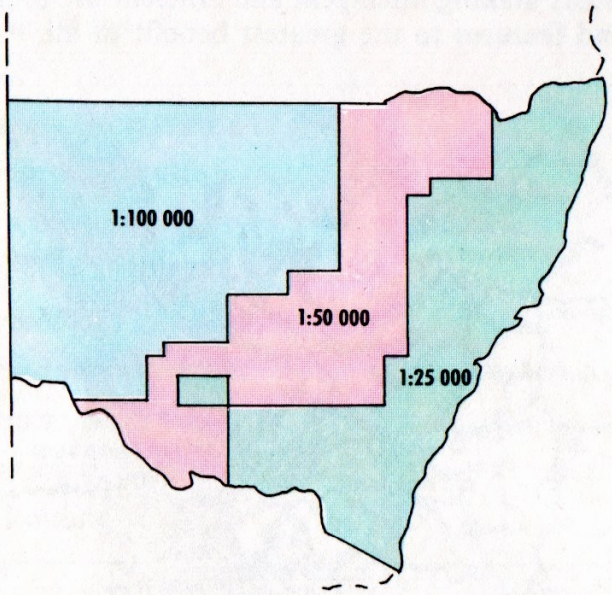
Historical Map of N.S.W. 1825

However, many map users are more vitally concerned with deriving information that will assist them to find their way about an area with a foreknowledge of the terrain and obstacles that may lie in their path. Topographic maps are ideal for this purpose, showing the earth's natural physical and cultural, or man-made features in such a way that close study of the map can give the user a detailed "picture" of the area represented.

Topographic maps are a pictorial representation of all significant natural features (hills, creeks, timber coverage etc) and man-made features (roads, railways, townships, buildings, etc) and many descriptive notes. They are a form of communication to convey to the map user the special relationship of features on the earth's surface.

Most of New South Wales is now covered by detailed **topographic maps at scales of 1:25 000 along the coastal** area, 1:50 000 inland and 1:100 000 in the far west.

MAPPING ZONES



The Land Information Centre has a large range of maps to suit varying needs. For information on the types of maps available and the extent of mapping, write for a free copy of the "Catalogue of New South Wales Maps".

Maps may be obtained from:-

The Land Information Centre, Panorama Avenue, Bathurst N.S.W. 2795.

The N.S.W. Government Information Service, Goodsell Building, Hunter Street, Sydney 2000.

Local CMA Map Agents.

The Department of Conservation and Land Management, 23-33 Bridge Street, Sydney 2000.

5 MAP SCALES " LARGE AND SMALL "

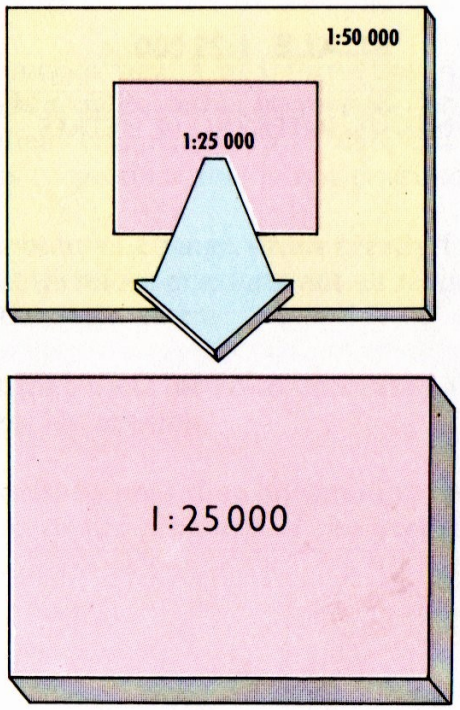
The words "large" and "small" when used to describe map scales are a source of confusion to many people.

A common misunderstanding is that a large scale map covers a large area and a small scale map a small area.

If you were to look at two maps of the same area but at different scales, the map on which features appeared larger would be the larger scale map of the two.

Scale is the ratio of the size of a feature as it appears on a map to its actual size. This ratio is known as the representative fraction (see page 6), for example 1:100 000 - one to one hundred thousand - is a smaller fraction than 1:50 000. Thus a 1:100 000 map is a smaller scale map than a 1:50 000 map.

At 1:250 000 (a smaller scale) it takes 544 maps to cover Australia, but it would take about 50,000 maps to cover the same area at 1:25 000 (a larger scale).



6 MAP SCALES AND DISTANCES

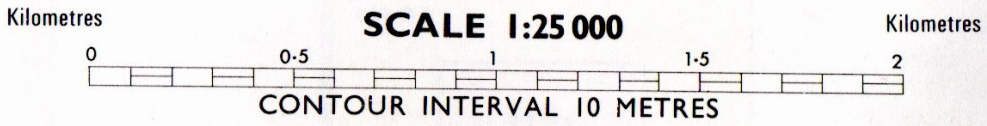
Ground features are shown on a map in the same relative position as their actual location, but symbolically reduced to a fraction of their true size. The amount or reduction applied is known as the representative fraction.

This fraction represents the relationship of a distance on the map to the actual distance on the ground.

For example, a map with a representative fraction of 1:25 000 means that one unit of distance on the map represents 25 000 units on the ground.
Thus, 1cm (on the map) = 25 000 cm (on the ground)
or 250 metres
or 0.25 kilometres

Clearly map reading becomes much easier with metric distances.

In addition to the representative fraction a linear scale or bar scale is shown.



Maintaining Direction Using a Compass

When moving through dense vegetation it is important that continuous checks be made using the compass. The best method of maintaining a given magnetic bearing is to select a prominent object (such as a tree) which lies on the bearing and move to it and continue repeating this procedure until the destination is reached. If a prominent object is not found, another person may be sent forward to serve this purpose.

The easiest method of measuring distances from a map is to use the linear scale that is provided on topographical maps. This scale bar sets out the ground distances for the equivalent map distances. By measuring the distance between two points on the map with a ruler, a strip of paper, or with dividers the ground distance is read off by setting out this dimension along the linear scale.

In measuring distances along a road, consider the road as a series of nearly straight sections. Record these as a continuous measurement on the edge of a piece of paper. The total distance is then read off the linear scale in the usual manner.

7 MAP REVISION

It will be appreciated that while natural features remain relatively undisturbed, cultural features are subject to constant change, and therefore the information on a map must be constantly revised.

Maps showing such a wealth of information as that on the topographic maps would need to be revised continuously in order to keep them completely up to date but with a large number of maps to produce this is not possible.

The rate and amount of change varies greatly from urban to remote areas and therefore maps are not all revised at definite intervals or to the same extent.

The needs of the map users for up-to-date maps are considered in selecting maps for revision.

Map users can assist by providing information on apparent errors or omissions to the producer of the particular map.

8 MAP BORDER INFORMATION

All map users should be familiar with information available in written and pictorial form around the edges of the map. This information identifies and explains the map. It also supplies details applicable to its use, the date of the information, and the sources from which it was obtained.

The type of information and the layout may differ slightly from one map to another. Listed are items that are normally part of the standard layout.

Map title, type of map (e.g. topographical, geological, etc), map edition and sheet number, magnetic variation diagram, grid reference block, legend of symbols, control and production data, index to adjoining sheets, map scale representative fraction), linear scale bar, contour interval.

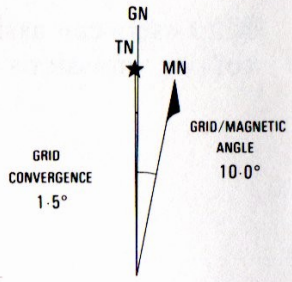
The following are some examples of the border information.

KATOOMBA 8930-I-S

TOPOGRAPHIC MAP
1:25 000 SECOND EDITION
NEW SOUTH WALES AUSTRALIA

ADJOINING MAPS

HARTLEY 8930-4-N	MOUNT WILSON 8930-1-N	KURRAJONG 9030-4-N
HAMPTON 8930-4-S	KATOOMBA 8930-1-S	SPRINGWOOD 9030-4-S
JENOLAN 8930-3-N	JAMISON 8930-2-N	PENRITH 9030-3-N



TRUE NORTH, GRID NORTH AND MAGNETIC NORTH ARE SHOWN DIAGRAMMATICALLY FOR THE CENTRE OF THE MAP. MAGNETIC NORTH IS CORRECT FOR 1980 AND MOVES EASTERLY BY 0·1° IN APPROXIMATELY THREE YEARS.

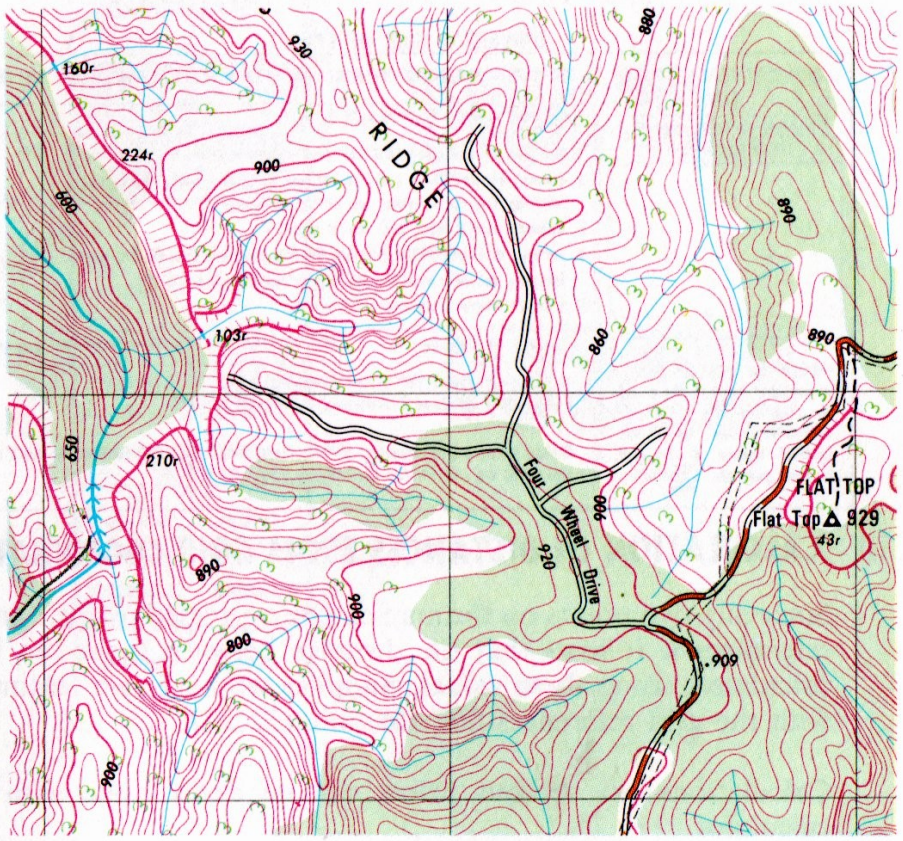
9 MAP REFERENCES AND GRIDS

Maps are provided with a system of squares called a grid and the ground distance represented between the grid lines that form the squares is usually quoted in the marginal information of the map. On the 1:25 000 topographical map series, the ground distance represented between grid lines is 1,000 metres or one kilometre.

The values quoted for the grid lines are their distances from a selected position called the false origin which is outside the map to the south-west. Thus all values are positive east and positive north from this false origin. This means that all positions on the map can be referred to by their "eastings" and "northings."

In a grid reference, the eastings are always quoted first. The full grid value is always shown in the margins near the south-west corner. For the remainder of the grid lines, only the digits representing 1,000s of metres are shown.

A grid reference is generally represented by six numbers. Suppose you wished to plot a grid reference 559727 on the sample below; the steps are as follows.



1. Divide the grid reference into two parts.

559 727

2. Find the easting grid line 55 along the top or bottom of the map.
3. Measure and mark 9/10th of the grid interval to the east of the grid line 55.
4. Find northing grid line 72 along the west or east edge of the map.
5. Measure and mark 7/10th of the grid interval to the north of the grid line 72.
6. Extend these marks into the map area parallel to the grid lines. Where they intersect is the map position required (see sample in page 9).

To determine the grid reference for a feature on the map, simply reverse the process.

Before giving a grid reference. users should state the number and name of the map. eg 8930-1-S KATOOMBA 559727
Notes on the grid reference system are generally shown in the border of topographical maps.

UNIVERSAL GRID REFERENCE

GRID ZONE DESIGNATION: 56H	TO GIVE A STANDARD REFERENCE ON THIS SHEET TO NEAREST 100 METRES			
100 000 METRE SQUARE IDENTIFICATION: KH	SAMPLE POINT: Flat Top △ 929			
	1. Read letters identifying 100 000 metre square in which the point lies:	KH		
	2. Locate first VERTICAL grid line LEFT of point and read LARGE figures labelling the line in either top or bottom margin:		55	
	3. Estimate tenths from grid line to point:		9	
	4. Locate first HORIZONTAL grid line BELOW point and read LARGE Figures labelling the line in either the left or right margin:			72
	5. Estimate tenths from grid line to point:			7
	SAMPLE REFERENCE:	KH559727		
IGNORE the SMALLER figures of any grid number; these are for finding the full co-ordinates. Use only the LARGER figures of the grid number; example: 325000	If reporting beyond 18° in any direction, prefix with Grid Zone Designation, eg: 56HKH559 727 Before giving a grid reference, civilian users should state the number and name of this map, e.g. 8930-I-S KATOOMBA 559727			

10 CALCULATION OF DISTANCES FROM GRID COORDINATES

Since any two points on the map can be expressed by their grid references it follows that the distance between them can be calculated, using these values. Suppose we have two features with the grid references 063 168 and 152 207.

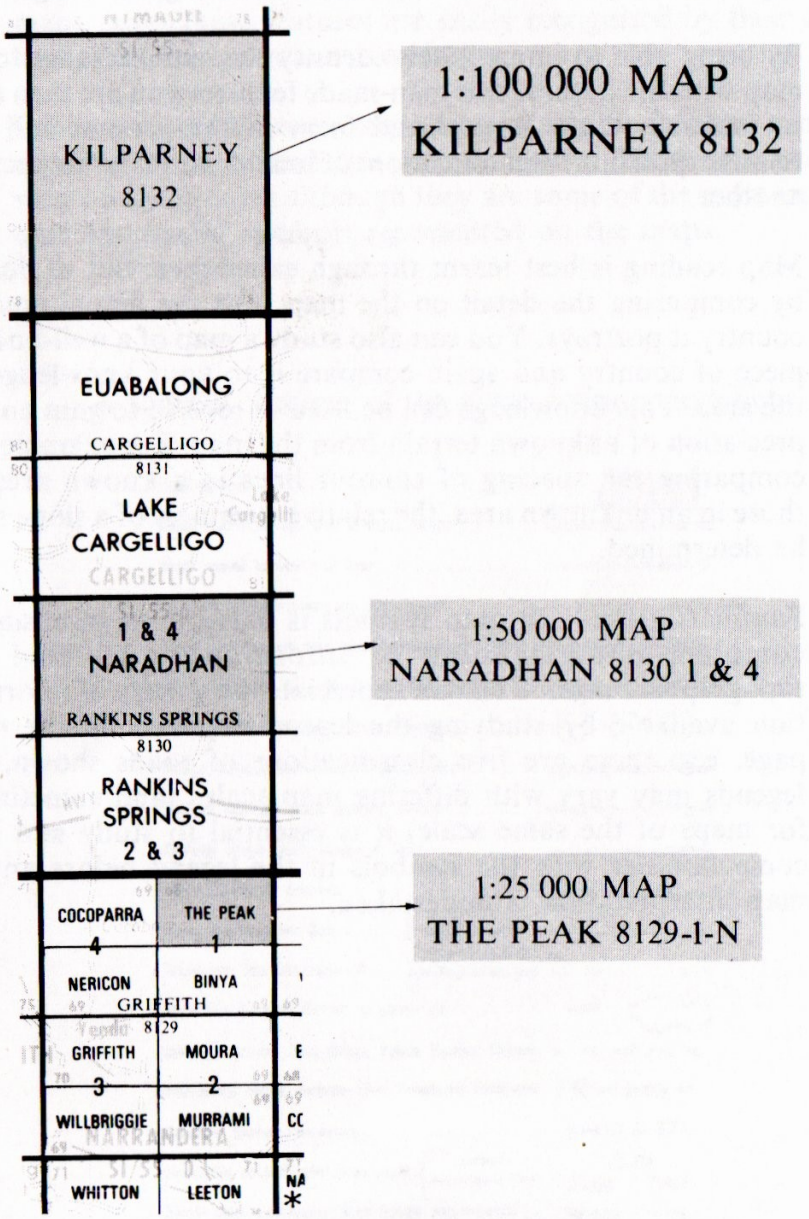
Calculations as set out below can be easily done with a calculator.

15.2_ 20.7_
06.3 16.8
8.9 3.9

Square both values 79.21 15.21
Add the values 94.42
Take square root
distance 9.72km or 9717m.

11 SHEET SYSTEM BREAKDOWN AND MAP NAMES

To determine medium scale map names and numbers the following system is used.



12 MAP INTERPRETATION

Map interpretation is the art of extracting from a map all the information it contains so that a "picture" can be drawn in the mind of the shapes and slopes of the ground, the pattern of streams and rivers, the vegetation cover and the location and nature of man-made features. Maps are sometimes described as 'pictures of the earth as seen from above' and their purpose is to allow a person to visualise far more of their surroundings than they are able to see when standing on the ground.

By being able to immediately identify the symbolisation on a map with the natural and man-made features you are then able to understand the nature and form of the ground and the relative position and direction of one feature in respect to another.

Map reading is best learnt through experience, out of doors, by comparing the detail on the map with the actual area of country it portrays. You can also study a map of a well-known piece of country and again compare it to your knowledge of the area. This knowledge can be used in reverse to gain an appreciation of unknown terrain from the map. For example, by comparing the spacing of contour lines in a known area to those in an unknown area, the relative steepness of a slope may be determined.

Familiarization with map symbols is paramount to ensure a complete understanding of information depicted on topographic maps. You will appreciate the variety of information available by studying the legend depicted on the next page, e.g. there are five classifications of roads shown. As legends may vary with differing map scales (and sometimes, for maps of the same scale) it is essential to study and become familiar with the symbols in the legend before any map interpretation is undertaken.

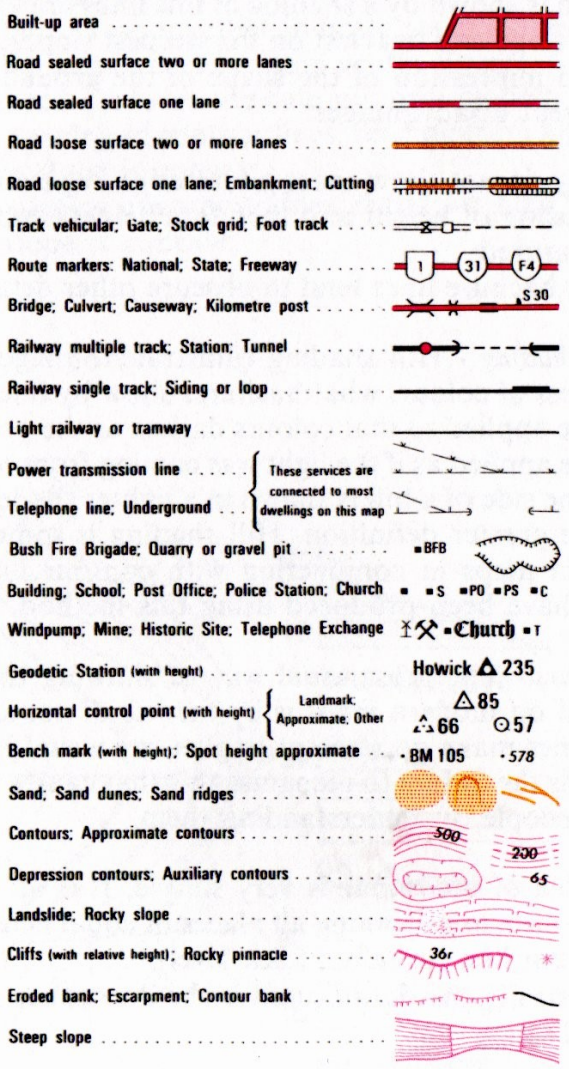
13 MAP SYMBOLS

Symbols are used on maps to represent features which exist on the ground, and draw to the map users attention significant features that would not be so easily recognised if they were drawn to scale and shape. A building of 10m x 10m at ground scale would appear as a speck at 1:100 000.

This would be far too small for easy identification. For this reason a symbol is substituted for clarity of classification. In many cases these features are easily recognised by their symbols (buildings, streams, roads).

Other symbols however, represent intangible features such as administrative boundaries and contours. These will not be seen on the ground although they are some of the most important and useful symbols represented on the maps.

A sample of some of the more common symbols:



The symbols used on a map are chosen because they add usefully to the information shown on the map, and are designed sc that they are readily identifiable with the feature they represent.

The use of colour is an additional aid to identification. Generally, blue for water features, black for culture (man-made) and green for vegetation are international standards. Other colours are then selected to show as clearly as possible any further information such as relief, road classification etc., so that the overall effect is pleasing and, more importantly, a legible combination of colour, symbols and type.

14 METHODS OF SHOWING RELIEF

There are many ways of showing relief on a map, including:

a. hachures;
b. hill shading
c. contours

Hachures.- With this method (illustrated on page 16) rising ground is shown by a shading of fine lines drawn down the line of the slope and heaviest on the steepest slopes. Hachures give a good impression of the shape of the ground but they have two great disadvantages:

a. They do not show exact information regarding height, only the illusion of height and therefore heights and slopes cannot be measured;
b. The hachure lines tend to obscure other detail on the map.

Hill Shading.- Hill shading (illustrated on page 16) shows, by darkness of colour, what hachures show by lines. The shading may be applied so that colours darken as the ground rises or it may be applied as if the light was coming from one direction so that one side of a hill is shown in a lighter shade than the other to give greater definition. Hill shading is sometimes used on modern maps in conjunction with contour lines. First class maps have been produced using this method.

Contours.- The most usual way of showing the shape of the ground on modern maps is by the use of contour lines. Contour lines make no attempt to give any visual illusion of relief and it is the failure to recognise this that causes difficulty, with some people, in understanding them.

The idea of a contour is very simple. It is an imaginary line drawn on a map, joining all places of equal height above a fixed datum line (usually at sea level).
In Australia the datum used is the Australian Height Datum (A.H.D.).

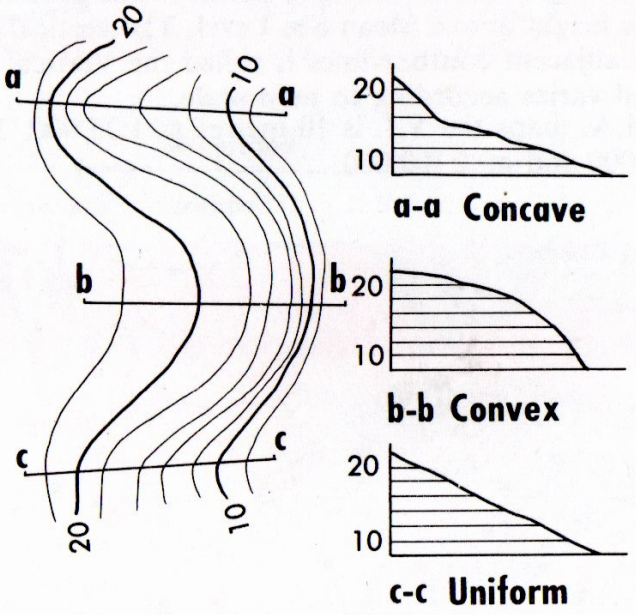
Height of Contours.-On the map, each contour is drawn at a specific height above a fixed datum and the vertical distance between contours does not vary. The difference in height between contours is called the Vertical Interval (VI) and is shown in the marginal information on the map. It is from the height and spacing of the contours that the shape of the ground can be deduced.

Some contours have the height shown at intervals along their length. On CMA maps these heights are mostly printed so that they read facing uphill. This can be of great assistance in determining the direction of high ground.

15 CONTOUR PATTERNS

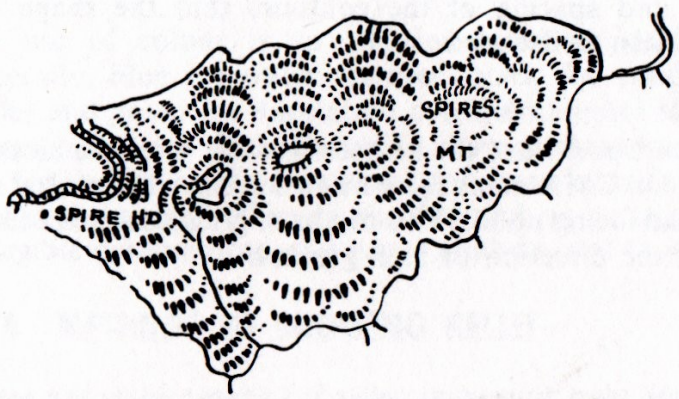
Each topographical feature, such as a spur or a knoll, is represented by its own particular contour pattern.

Important Points.-The most important points to remember about contour patterns are;
a. contour lines close together indicate steep slopes;
b. contour lines far apart indicate gentle slopes;
c. evenly spaced contours indicate uniform slopes;
d. when the spacing of contour lines, reading from high to low, decrease, the slope is convex;
e. when the spacing of contour lines, read from high to low, increase, the slope is concave.



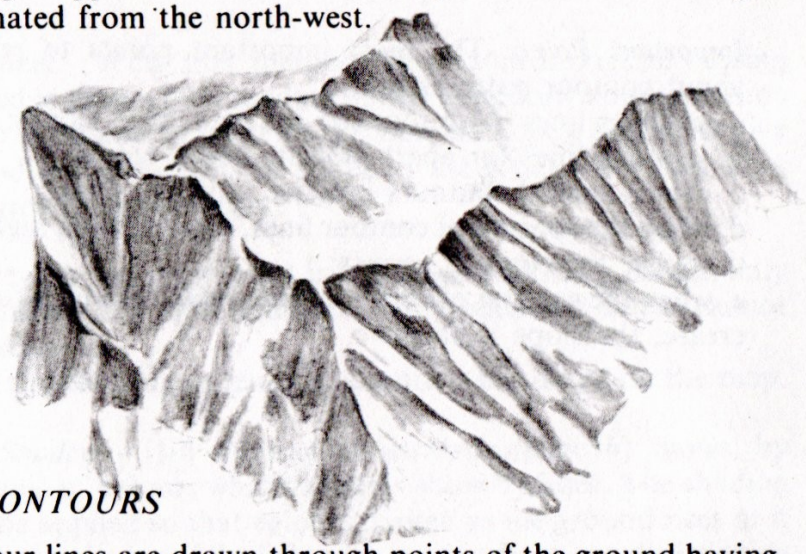
a HACHURES

Hachures show the relief by means of short disconnected lines. Short, dense lines depict steep slopes while longer and more spaced out lines suggest more gentle slopes.



b HILL SHADING

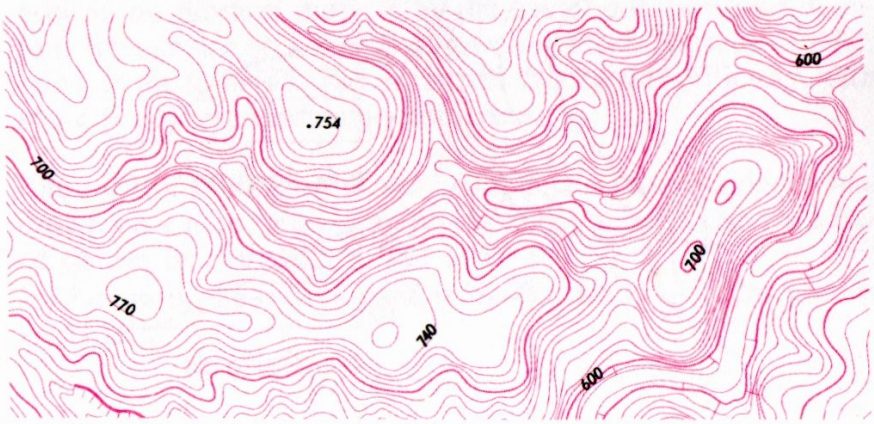
To aid the map user in visualising terrain features, relief shading is applied. The hills and valleys are shaded as though illuminated from the north-west.



c CONTOURS

Contour lines are drawn through points of the ground having the same height above Mean Sea Level. The vertical distance between adjacent contour lines is called the Vertical Interval (V.I.) and varies according to map scale.

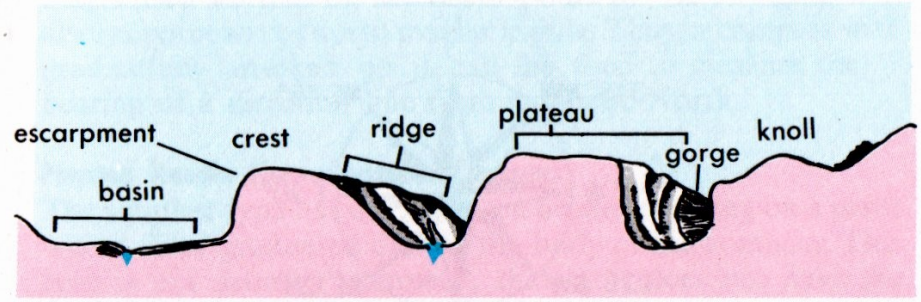
On C.M.A. maps the V.I. is 10 metres at 1:25 000, 20 metres at 1:50 000 and at 1:100 000.

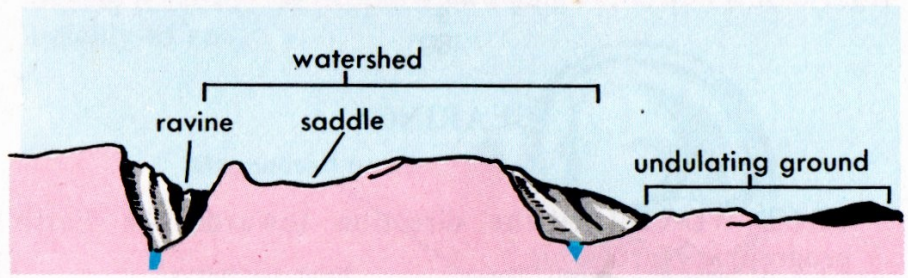


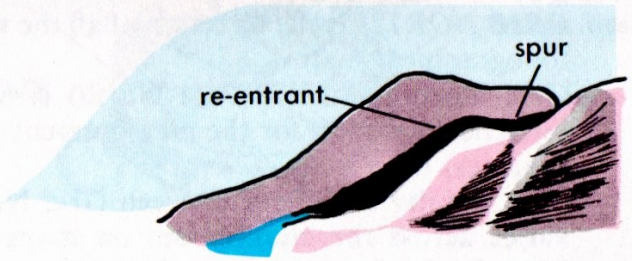
16 TERMS USED IN MAP READING

Some common terms used in map reading to describe various physical features are listed below.

a. Basin. An area of reasonably level ground surrounded or nearly surrounded by hills, or an area drained by a river and its tributaries.
b. Crest. The highest part of a hill or mountain range. That line on a range of hills or mountains from which the ground slopes down in opposite directions.
c. Escarpment. The steep hillside formed by a sudden drop in the general ground level, usually from a plateau.
d. Gorge. A deep ravine, usually with steep sides.
e. Knoll. A small knob-like hill.
f. Plateau. A tableland; an elevated region of considerable extent, generally fairly level.
g. Ravine. A long, deep valley worn by a stream.
h. Re-entrant. A valley or ravine, usually between two spurs, running inwards towards the hill or mountain top.
i. Ridge. The line along a hill or range of hills or mountains from which the water flows in opposite directions; sometimes the crest of a line of hills as it appears along the horizon.
j. Saddle. A depression between adjacent hill or mountain tops; also called a col.
Spur. A minor feature, generally in the form of a ridge running out from a hill or mountain.
l. Undulating Ground. Ground which rises and falls gently.







17 REPRESENTATION OF HEIGHT

Heights (or elevations) above sea level at specific points are depicted in several ways, the more common being by:

a) Bench Mark. These have the most precise heights. They are permanent survey marks placed at intervals along levelling routes. The height given is that of the mark, not the level of the ground.

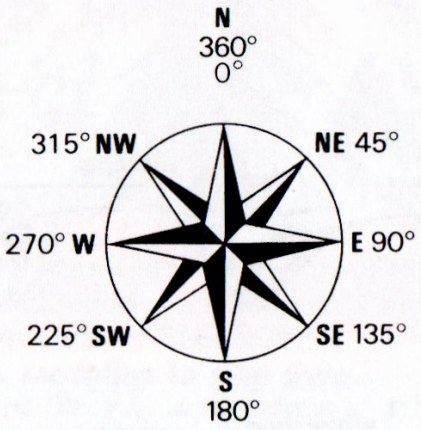
b. Geodetic Stations. These are usually shown on maps and are defined on the ground normally by a mark in a concrete block under a survey beacon or concrete observing pillar

c. Spot Elevation. These are less accurate heights and are without a definite mark on the ground. They are selected to indicate the height of the ground at ruling points such as tops of hills.

Bench mark (with height); Spot height approximate..... BM.162 · 146

Geodetic station (with height)..... Boban △ 176

18 DIRECTION FINDING



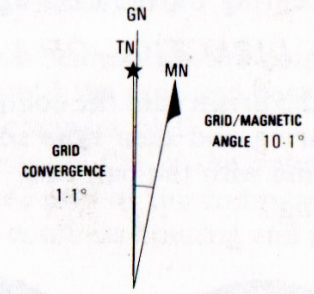
BEARINGS

TRUE NORTH is the direction towards the Earth's geographic North Pole.

GRID NORTH is the direction of all the vertical grid lines on a topographical map.
Grid North (and not True North) is normally used as the reference direction for the measurement of bearings (i.e. grid bearings) on a map.
(The angular difference between Grid North and True North varies across the country but on maps with the Australian Map Grid it is always less than 2°).

MAGNETIC NORTH is the direction in which the magnetic compass needle points, i.e. towards the north magnetic pole. Across Australia the direction of Magnetic North varies from about 5° west to about 15° east of Grid North.

The map border information will state the actual Grid-Magnetic (G-M) angle for the area covered by the map. The change in the G-M angle over the years (caused by the slight movement of the north magnetic pole) is also shown.



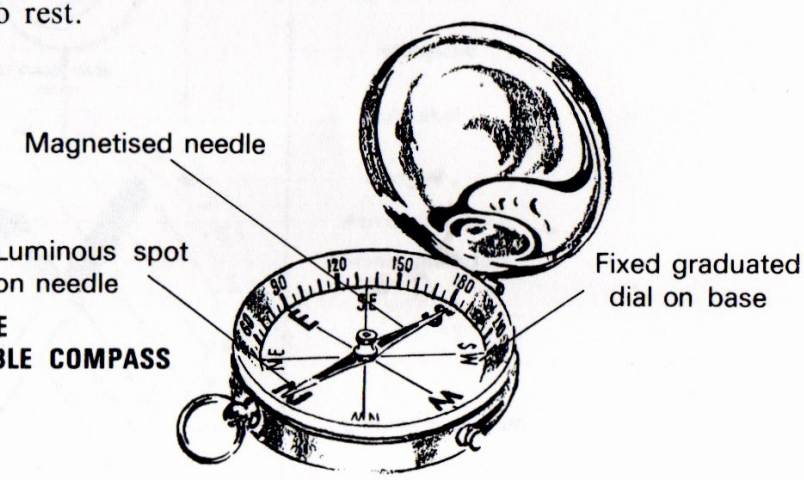
TRUE NORTH, GRID NORTH AND MAGNETIC NORTH ARE SHOWN DIAGRAMMATICALLY FOR THE CENTRE OF THE MAP. MAGNETIC NORTH IS CORRECT FOR 1975 AND MOVES EASTERLY BY 0·1° IN APPROX. THREE YEARS.

19 THE MAGNETIC COMPASS

The magnetic compass is an important aid to route finding and one should be carried by any venturer into untracked country. Magnetic compasses work on the principle that the pivoting magnetised needle, or the north point of the swinging dial always point to the north magnetic pole. Thus, a compass with graduations marked on it can be used to measure the bearing of a direction line from magnetic North.

Pivoted Needle Non-adjustable Compass

The simplest type has a magnetised needle swinging on a pivot with a fixed graduated dial on the body of the compass. This type is not usually "damped", that is, it does not have the facility to steady the excessive swinging of the needle to bring it quickly to rest.



PIVOTED NEEDLE NON-ADJUSTABLE COMPASS

PRISMATIC COMPASS

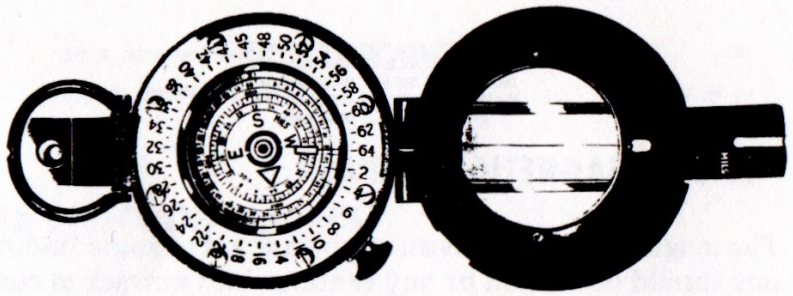
By incorporating a damping system and a prism magnifier to read the bearings more accurately, the Prismatic Compass is the most refined of the range of hand held compasses.

TO TAKE A BEARING

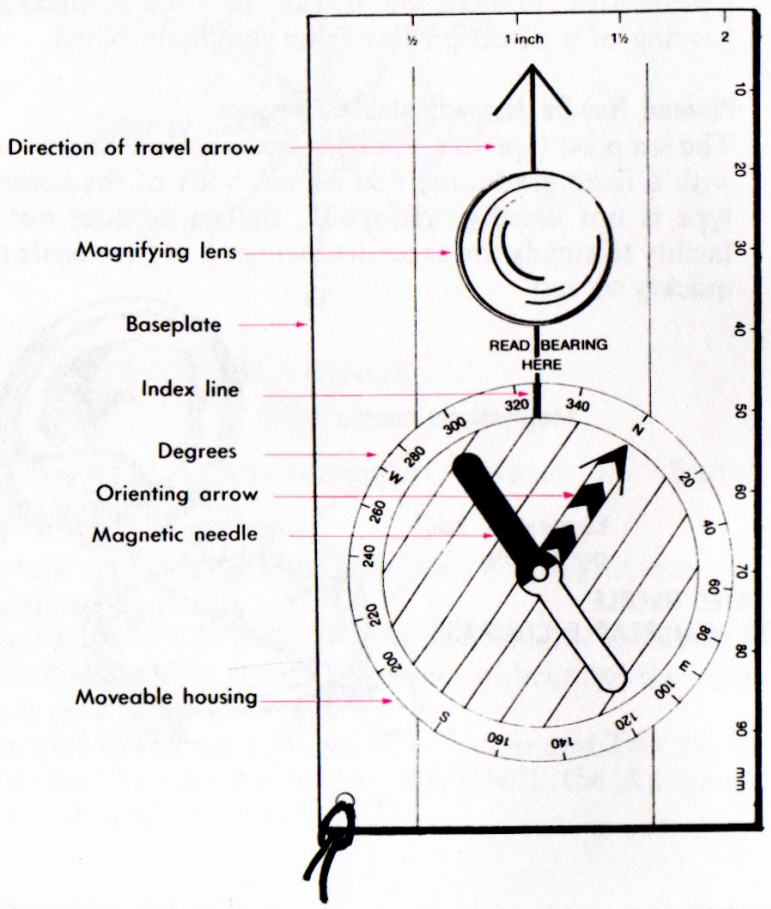
Hold the compass in a steady position, in both hands with a thumb through the ring, the lid vertical and the prism turned over in the reading position. Looking through the prism, line up the object with the hair line in the centre of the prism slot and read off the bearing on the card against the hair line.

TO FIND THE DIRECTION OF A GIVEN BEARING

Looking through the prism turn the compass until the hair line cuts the given bearing and then note some object in the distance which is in line with the hair line. This object will be on the required bearing.



THE SILVA ADJUSTABLE DIAL COMPASS



TO TAKE A GRID BEARING FROM A MAP

1. Place the long edge of the compass plate along the desired bearing making sure that the direction arrow on the compass plate points in the direction you wish to travel.
2. Turn the compass housing so that the meridian lines are parallel with the grid lines (eastings) on the map.
3. Read the grid bearing on the housing where the index line intersects it. Do not forget to apply the G-M angle to grid bearing to convert it to the correct compass (magnetic) bearing.

SETTING THE COMPASS TO TRAVEL ON A MAGNETIC BEARING

1. Set the magnetic bearing on the compass by rotating the compass housing until the required bearing is in line with the index line on the compass plate.
2. Holding the compass flat in the palm of the hand, turn it around until the red end of the compass needle points to the north mark on the compass housing and is parallel to the meridian lines.
3. The direction arrow now points along the required magnetic bearing.

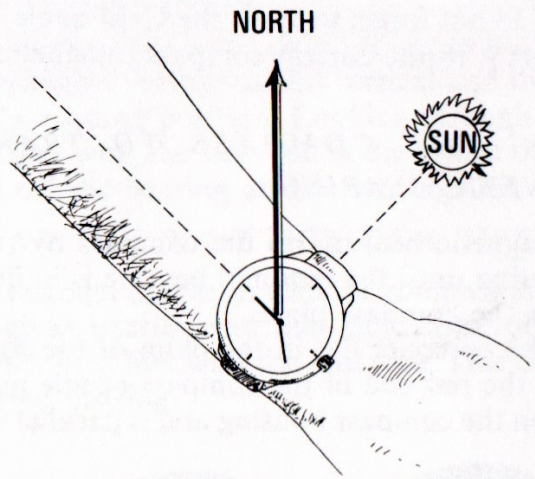
TO TAKE A MAGNETIC BEARING

1. Hold compass with the direction arrow pointing to the object.
2. Rotate the compass housing until the red arrow of the meridian line is directly beneath the red (north) end of the compass needle.
3. Read the magnetic bearing on the housing where the index line intersects it. In this case the G-M angle must be applied to convert this magnetic bearing to a grid bearing.

20 FINDING DIRECTION WITHOUT A COMPASS OR A MAP

BY DAY WITH SUN VISIBLE

Method. If the sun is visible, point the figure 12 on a watch towards the sun, then true north is approximately halfway between the 12 and the hour hand.

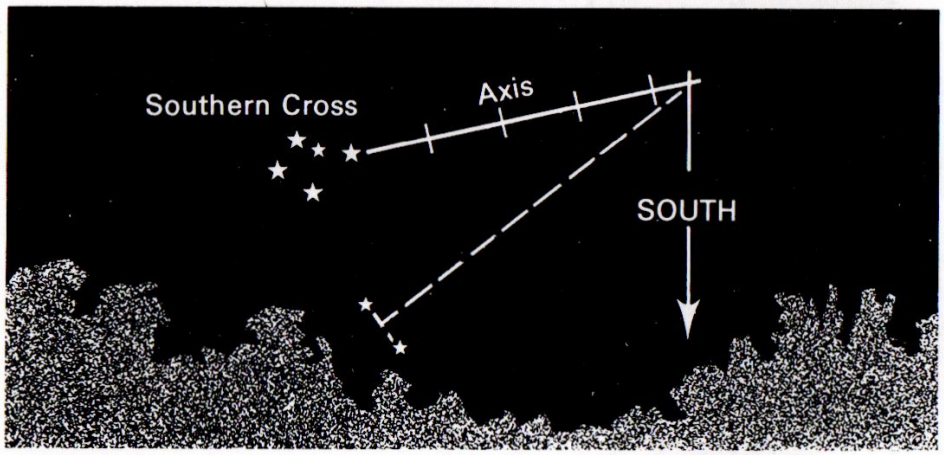


WITH THE SOUTHERN CROSS AND THE POINTERS VISIBLE

Method 1. If the stars are visible, extend the long axis of the Southern Cross from its tail by 4.5 times its length; this point is almost directly above true south.

Method 2. Draw an imaginary line to join the two pointers and then bisect that line with another at right angles to it. The direction of the South Pole will then be directly below the intersection of that line and that which is a prolongation of the long axis of the Southern Cross.

Note: All the above methods only apply in the Southern Hemisphere.

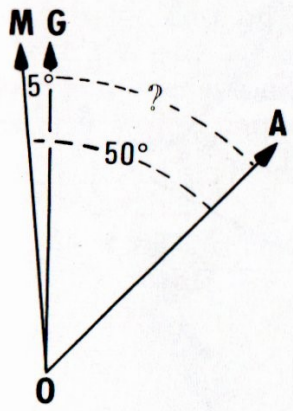


21 CONVERSION OF BEARINGS

Compass bearings taken on the ground must be converted to grid bearings for plotting on a map. Conversely, grid bearings taken from a map will have to be converted to magnetic bearings before they can be used with a compass on the ground. To convert a bearing from grid to magnetic or magnetic to grid add or subtract the magnetic variation. (G-M angle)

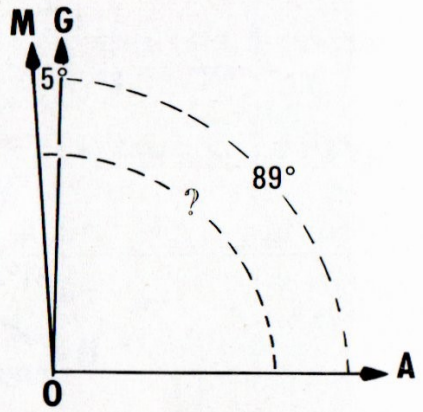
Example 1 A magnetic bearing of 50° has to be converted to a grid bearing. The magnetic variation is 5° west.

Example 2 A grid bearing of 89° has to be converted to a magnetic bearing. The magnetic variation is 5° west.



Grid Bearing

50°-5° = 45°

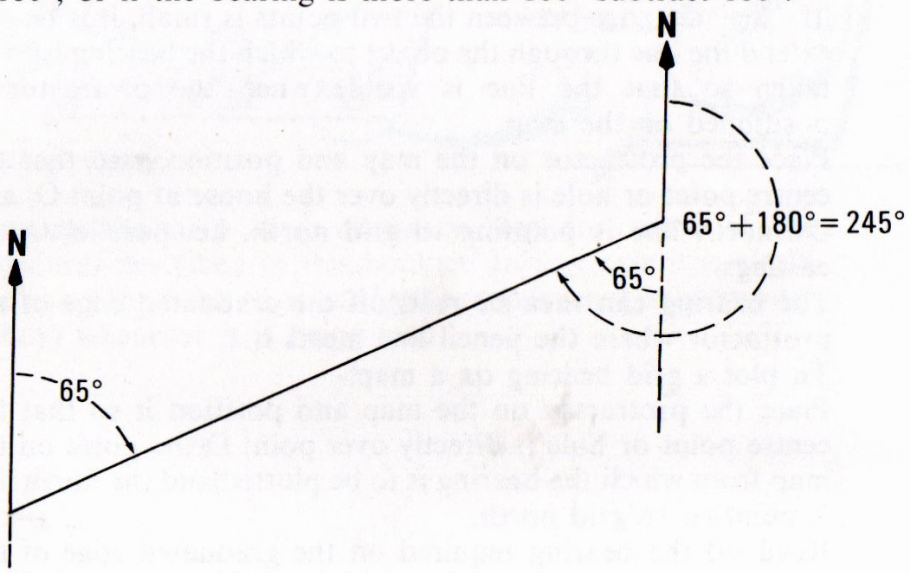


Magnetic Bearing

89°+5° = 94°

Back Bearings

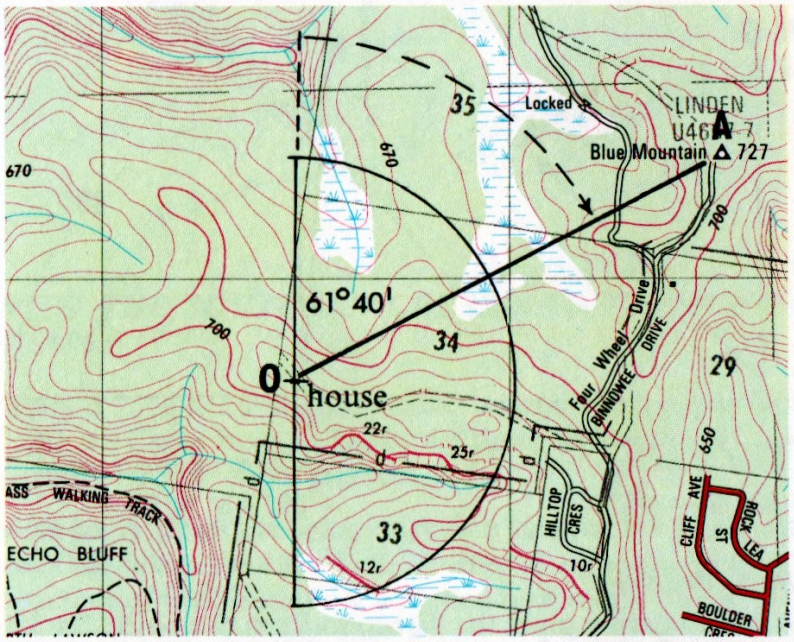
A back bearing gives the direction from the object back to the point of observation. It is clear from the figure below that the difference between the bearing and the back bearing is 180° Therefore, given the bearing, to find the back bearing add 180°; or if the bearing is more than 180° subtract 180°.



22 USING A PROTRACTOR

To accurately measure a bearing on a map a protractor may be used. There are many different types of protractors available and although they differ in design and shape they are used in much the same way. The outer edge of the protractor is graduated in degrees from 0° to 360° clockwise (or when the protractor is half circle 0° to 180°).

USE OF THE PROTRACTOR

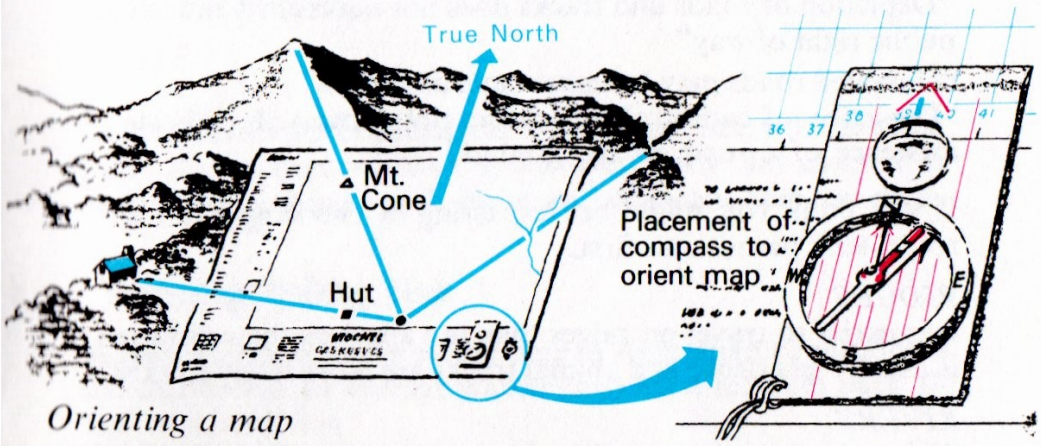


To measure the bearing from the house at point O to Blue Mountain △ 727 at point A:-
Using a straight edge and a fine pencil, join O and A
If the distance between the two points is small, it is best to extend the line through the object to which the bearing is to be taken so that the line is visible when the protractor is positioned on the map.
Place the protractor on the map and position it so that the centre point or hole is directly over the house at point O, and the north line is pointing to grid north, i.e. parallel to the eastings.
The bearing can then be read off the graduated edge of the protractor where the pencil line meets it.
To plot a grid bearing on a map:-
Place the protractor on the map and position it so that the centre point or hole is directly over point O(the point on the map from which the bearing is to be plotted)and the north line is pointing to grid north.
Read off the bearing required on the graduated edge of the protractor and mark the map with a pencil
Remove the protractor and draw a thin line through point O and the pencil mark. This line is the required grid bearing.

23 ORIENTING A MAP

A map is said to be oriented when it is placed so that directions on it correspond to the directions to the same features on the ground. This may be done be holding the map horizontally and rotating it until identifiable features lie in the same direction on the map as they do on the ground.
However, if none of the surrounding features can be identified the following method, using a compass is suggested.
1. The compass points to Magnetic North.
2. The angle between Grid North and Magnetic North (the G-M angle) is given in the border notes - see page 19. (This gives the bearing of all grid lines in relation to Magnetic North).
3. Supposing the G-M angle is 10° East. This means Magnetic North is 10° East of Grid North.
4. With the map laying flat, rotate the map until the north-south grid lines are on a compass bearing of 350°.
The map is now correctly oriented.

Rule: If Magnetic North is east of Grid North subtract the G-M angle.
If Magnetic North is west of Grid North add the G-M angle.



Orienting a map

Orienting the map is a necessary step for some of the procedures described in this booklet. In any case it is worth developing the habit of orienting the map (even if only approximately) whenever it is being read.

24 CROSS COUNTRY NAVIGATION

Navigation Aids

MAPS AND AERIAL PHOTOGRAPHS
A map is the single most important navigation aid and should be carefully studied, together with aerial photographs, if available, as a preliminary to cross-country navigation. The confidence of the user will be greatly increased by having foreknowledge from a map of the general lie of the land and consequently the best route to take and the areas to avoid.

COMPASSES
The compass is an invaluable aid when traversing country where landmarks are sparsely separated or identification of them is difficult, such as at night.

Planning It is essential that before setting off on a course, a detailed study of the map is made, involving the following:

TOPOGRAPHY
It is far easier to follow the natural topography of the country than to go against it and therefore a direct route in the form of a straight line is practical only in relatively flat, open country.

ROADS
The following types of warning are included on most maps:
"Depiction of roads and tracks does not necessarily indicate a public right of way"
"Unsealed roads may be impassable after rain"
"Depiction of cadastral roads does not necessarily indicate existence of a road on the ground"

If you think you might be trespassing by choosing a certain route, seek permission first.

RIDGES
It is easier to travel on ridges than in valleys as the vegetation is usually less dense and animal tracks are more likely to exist.

RIVERS
Although rivers are useful aids to direction keeping, it is generally poor policy to follow them as they are usually winding and bordered by dense vegetation.

NAVIGATION DATA SHEET
Before commencing a course, the route to be taken should be divided into legs that should terminate at some easily recognisable object. Having done this, the next step is to produce a Navigation Data Sheet for the complete route. This provides the significant information required for each leg of the overall route and becomes a ready reference for the user.

Checking

Once a course commences, checking must be continuous. Areas requiring particular attention are covered below.

Location

All features, hills and rivers should be checked as they are reached and identified on the map. Note the direction of flow of all streams and rivers and check with the map.
Tracks should always be regarded with suspicion. It is easy to place too much confidence in a track which may not be the one marked on the map.

Distance Travelled

It is very important, particularly when moving through vegetation, to know the distance which has been covered. There are two basic methods of achieving this :-

PACING

This is generally accepted as being the more reliable method. Distances can be counted in number of paces. Experience has shown that over long distances it is better to count right foot paces only, rather than each pace. For an average pace of 80cm, 625 right foot paces will equal one kilometre. When estimating distance from the map, allowances must be made for the rise and fall of the ground as a person is inclined to take shorter paces when climbing or descending than when travelling on flat ground ;

TIME

Distance can also be calculated by knowing that, with an 80cm pace, the average walking speed over fairly flat country is about 5km per hour - each hour walked means 5km travelled.

Predicting Walking Time

A rule for predicting walking time in Australian conditions is as follows: for an average walker carrying a medium pack allow one hour for;
Every 5km of easy going.
Every 3km of easy scrambling.
Every 1 km of extremely rough country, deep sand, soft snow or thick bush.
Plus one extra hour for every 500m up and one extra hour for every 100m down.
For every five hours, allow one extra hour for fatigue.

Conclusion

Cross country navigaton is not easy, but the difficulties are easily overstated. Providing methodical map study and planning are undertaken, followed by careful use of the map and compass, many of the problems should be overcome. With experience, the individual will gain confidence in himself, his map and his compass.

MAP READING GUIDE

CMA

KATOOMBA

RADIATA PLATEAU

PECKMANS PLATEAU

MEGALONG PLATEAU

MOUNT ELPHINSTONE

NELLIES GLEN

Devils Hole Creek

Megalong Creek

NARROW NECK

CATALINA RACING CIRCUIT

THE THREE SISTERS

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